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Senior High School
CURRICULUM GUIDE

GENERAL MECHANICS 15 - 16 - 17
(Interim Edition, September, 1955)

Province of Alberta
Department of Education

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COURSE CREDIT VALUES

General Mechanics 15 - 4 or 5 credits

General Mechanics 16 - 4 or 5 credits

General Mechanics 17 - 4 or 5 credits

GENERAL MECHANICS 15
GENERAL MECHANICS 16
GENERAL MECHANICS 17

This is a series of high school Industrial Education courses suitable for use in the one-instructor comprehensive shop. The importance and wide general use of these courses become apparent when it is realized that there were 125 such shops in operation in Alberta in 1955.

The desirable comprehensive shop has accommodation and equipment which makes it possible to offer worthwhile experiences in drafting, woodwork, metalwork, electricity and automotives. Ordinarily it does not have sufficient accommodation and equipment in any one of the above areas, with the exception of drafting and woodwork, to permit a complete class to be given instruction and to carry out related activities in a single area as a group. However, it is often feasible to handle a reasonably sized class in both the woodwork and drafting areas. The other areas are offered by employing general shop procedure.

This series of courses recognizes:

1. That the differences in the accommodation and equipment existent are a factor in determining the program.

2. That the course content may vary between communities in accordance with the socio-economic factors peculiar to individual communities.

The result is that the General Mechanics programs may vary in certain aspects from center to center in the Province.

The General Mechanics courses are therefore designed: to serve the students' best interests, recognizing particularly the local as well as the provincial environment; and to foster the maximum use of equipment and accommodation in the comprehensive shop.

GENERAL OBJECTIVES OF THE GENERAL MECHANICS PROGRAM

In making decisions and value judgments with regard to shop programs and activities the following should be used as guiding principles:

THE STUDENT'S INTENTIONS ARE:

1. To make useful objects.

2. To "learn about" and "to do".

THE INSTRUCTOR'S INTENTIONS ARE:

1. To efficiently improve student behaviour by providing an environment which fosters the development of:

   skill and knowledge
   desirable attitudes and
   desirable work habits

2. To teach the student the industrially accepted procedures and information which will be immediately useful in the home situation and in project construction.

The result of the interaction of student-environment-instructor is PLANNED and PURPOSEFUL ACTIVITY reinforced by demonstration and instruction.

To achieve the maximum effectiveness from this planned activity the instructor facilitates efficient individual student growth and development by ensuring that each student has the opportunity to:

1. Develop a reasonable degree of skill and knowledge with regard to selected media, tools and machines.

2. Develop the ability to solve problems peculiar to shop situations.

3. Develop acceptable work habits.

4. Develop desirable attitudes especially with regard to safety.

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SECTION A

THE HIGH SCHOOL SHOP PROGRAM IN THE COMPREHENSIVE SHOP

The following 4 or 5 credit courses may be considered as suitable for the comprehensive shop which has suitable accommodation and adequate equipment:

General Mechanics 15
General Mechanics 16
General Mechanics 17
Woodwork 10
Electricity 10
Automotives 10
Metal 10

SPECIAL NOTE: Students may now receive credit for both Woodwork 10 and General Mechanics 15. These courses cannot be taken concurrently. If a student registers in Woodwork 10 after having General Mechanics 15 (or visa versa) the instructor must make certain that content and activities are not duplicated with those of the first course taken.

In addition the following courses are available as sequential courses:

Woodwork 21 (4 or 5 credits).....Wood 10 prerequisite
or
Woodwork 20 (8 or 10 credits) ....Wood 10 prerequisite
Electricity 21.....Electricity 10 prerequisite
Automotives 21.....Automotives 10 prerequisite
Metal 21.....Metal 10 prerequisite.

With the exception of the wood courses, ordinarily the single phase courses (Automotives 10, Electricity 21, Metal 10) are not realistic offerings in the comprehensive shop either from the viewpoint of accommodation and equipment, or students' best interests. A number of shops successfully offer the wood courses only, and this is recommended where the students concerned have not had Junior High School Industrial Arts courses.

However, for most centres the General Mechanics series of courses are recommended as the best selection because:

1. They offer a breadth of experiences in a number of phases.

2. They are organized in such a manner as to make the maximum use of all of the tools and equipment in the shop.

3. They are the only course series which lends itself to cycling. (Obviously any combinations of courses from the first year list may be cycled, such as Metal 10 and Electricity 10, but for reasons previously stated these courses are not entirely suitable for this type of shop).

4. They obviate the necessity for double-programming. This is the method of scheduling whereby two or more courses are offered simultaneously to the different groups in any one class. It is the result of different grade groups being combined in the shop for one class. Certainly at the High School level this procedure is to be avoided if possible. This may be done by selecting courses which lend themselves to the cycling procedure.

NOTE: In situations where junior and senior high school students are combined into one class it will, of course, be necessary to group the junior high school separately from the high school and double-programming is in this case a necessity.

The following course selection is suggested (it will be obvious that many other possibilities exist):

1. For centres desiring one high school course:

GENERAL MECHANICS 15 or WOODWORK 10 (every year)

2. For centres desiring two high school courses:

GENERAL MECHANICS 15 and GENERAL MECHANICS 16 (every year or cycled)

OR

WOODWORK 10 and WOODWORK 21 (every year or double-programmed)

3. For centres desiring three high school courses:

GENERAL MECHANICS 15, 16, 17 (every year or cycled)
OR
GENERAL MECHANICS 15, GENERAL MECHANICS 16, WOODWORK 10
(every year or cycled)
OR
GENERAL MECHANICS 15, WOODWORK 10, WOODWORK 21
(as situation requires)

4. For centres desiring four or more courses:

Centres giving this degree of emphasis to the high school shop courses should have accommodation and equipment to offer at least two of: Wood 10, Electricity 10, Automotives 10 and Metal 10. These industrial areas are augmented and new areas introduced by selecting one or more of the General Mechanics courses. In the few centres now offering such a program the following combinations exist:

WOOD 10 METAL 10 WOOD 21 METAL 21
OR
WOOD 10 WOOD 21 METAL 10 G.M. 15
OR
WOOD 10 AUTO. 10 G.M. 15 G.M. 16
OR
WOOD 10 AUTO. 10 METAL 10 G.M. 15
ETC.

In deciding the shop program it is essential to:

1. Determine and meet the student needs.

2. Offer a diversity of program and enable the student to enjoy a breadth of industrial experiences.

3. Make maximum use of shop accommodation and equipment.

4. Limit the program to industrial areas in which the instructor is competent.

ORGANIZATION OF COURSES AND USE OF THE COURSE OUTLINE

When it has been decided that or or more of the General Mechanics courses will be used for the high school students, it will be necessary for the instructor to make decisions regarding the course content. This will require consideration and good judgment. The following factors must necessarily influence the decisions:

The Student:	What previous shop courses has he taken? What shop interests has he developed at home? What is his educational plan? What is his vocational intention?
The Shop Accommodation:	A basement room would influence the decision. The type of floor will have some influence. The size will be important.
Shop Equipment:	This should be increasing as the years go by, but its influence on the course organization will be obvious.
The Instructor:	The instructor's training, interests and abilities will also be a factor.
Other High School Shop Courses:	What shop courses have the students taken previously? Are other shop courses being taken concurrently?

The outline has been written as 20 units each requiring 8 or 10 weeks of work. With the considerations mentioned above in mind, the problem is one of selecting the most appropriate units and organizing to the greatest advantage of the majority of students. The following principles are basic to the General Mechanics series:

1. Each course comprises four units selected from <u>either two or three industrial areas</u> (see Section E). It would be apparent that there is often a relationship between the work done in the various phases.

2. All students in any one class should follow the same course outline.

3. General shop procedure is employed when necessary.

4. When woodwork is selected as a phase two units should be selected and integrated into one twenty-week period of instruction.

Some Suggested Unit Selections

1. In centres offering General Mechanics 15 only:

Units 1, 2, 3, 7
or Units 1, 4, 7, 9
or Units 4, 5, 7, 11
or etc.

2. In centres offering General Mechanics 15 and General Mechanics 16:

General Mechanics 15 -	Units 1,2,3,7	or	Units 4,5,14,15
General Mechanics 16 -	Units 4,5,6,11		Units 1,2,16,17

3. (a) In centres offering General Mechanics 15, 16 and 17:

General Mechanics 15 -	Units 1,2,7,8		Units 1,2,8,9
General Mechanics 16 -	Units 4,5,11,12	or	Units 4,5,14,15, or etc.
General Mechanics 17 -	Units 3,6,16,17		Units 3,6,18,19

(b) In centres offering the combination General Mechanics 15, General Mechanics 16 and Woodwork 10:

General Mechanics 15 -	Units 7,8,11,12	or	Units 11,12,14,15
General Mechanics 16 -	Units 9,10,14,15		Units 16,17,19,20
Woodwork 10	- as prescribed.		

(c) In centres offering the combination General Mechanics 15, Woodwork 10 and Woodwork 21:

General Mechanics 15 -	Units 7,8,14,15	or	Units 11,12,18,19 or etc.
Woodwork 10	- as prescribed		
Woodwork 21	- as prescribed		

SECTION B

SHOP ADMINISTRATION

Much of the material published in the Junior High School Curriculum Guide "Industrial Arts Grades VII - VIII - IX" under Section C entitled General Information applies and the instructor should refer to this section. The following information is particularly relevant to the High School program.

Course Credit Values

Each of these courses may be offered for either 4 or 5 credits.

The number of minutes required per credit should be the same as that which is used in the home school of the class concerned. In this respect for schools of other than standard instruction time the current Senior High School Handbook should be consulted.

Instructor's Records

Every instructor should keep the following records:

(a) Enrolment and attendance.

(b) Record of theory taught, and tests administered.

(c) Record of student achievement, including project marks and test marks.

(d) Inventory of shop equipment.

With regard to the instructor's records it is recommended that these be simple and efficient so that a minimum of time is required to maintain them. Many instructors find that one hard-backed notebook will suffice for all purposes excepting the inventory.

Student Records

Every student must be required to maintain a notebook which should be considered and evaluated as a project. It is essential that such a book be checked frequently for English usage, spelling, punctuation, etc. This is the opportunity for the shop instructor to make a realistic contribution to the school program in English. The instructor must insist that errors noted are corrected by the students.

A student's notebook should contain:

(a) Notes on theory learned. These should be prepared by the student and not dictated by the instructor.

(b) Projects, drawings, plans of procedure and bills of materials showing calculation of costs.

(c) Pictures and articles pertinent to the various phases.

(d) Glossary of technical words and terms.

Size of Classes

An important consideration in determining the maximum size of class is the size of the shop. Seventy-five square feet of shop working area per student is considered necessary for the General Mechanics courses. The recommended maximum size of general shop in Alberta is, for grant purposes, about 1,900 square feet. Such a shop will accommodate twenty students (1,500 square feet of shop working area and 400 square feet of auxiliary area). Where stress is being given to the units dealing with automotives and farm machinery at least one hundred square feet per pupil should be available. When class sizes exceed a reasonable number the Principal must be advised.

In any case where classes are double-programmed it is recommended that the maximum class size not exceed 15 students.

The shop instructor is directly responsible to the Principal for efficient operation in his classes. In making decisions instructors should always bear in mind that they have the important responsibility of ensuring that each student in his class is achieving to his capacity.

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Evaluation

This is a matter in which it is most difficult to be objective. However, the following is suggested as a fair proportion of the factors which should be considered in the evaluation of a student's success in an industrial arts course:

JOB . . . . . 60% (includes project work, test marks, group work, etc.)

ATTITUDE . . . . . 20% (an evaluation of the degree in which the attitudes and habits have been achieved).

ACHIEVEMENT . . . . 20% (an evaluation of skills and abilities).

Shop Equipment

It is expected that centres offering the High School General Mechanics program will have more extensive equipment than those offering Junior High School Industrial Arts only. It is expected for example that the following items will be available:

WOOD: A good circular saw, jointer, lathes, tool grinder, portable sander.

METAL: Some arrangement for heat treating metal, sheet metal machines and stakes. A metal lathe would be very desirable.

ELECTRIC: Some arrangement which facilitates some wiring experiences, meters, etc.

AUTOMOTIVES: A number of running models and a selection of demonstration equipment.

OTHERS: Special equipment concerned.

SECTION C

THE SHOP SAFETY PROGRAM

The development of desirable attitudes and practices with respect to health and safety are such an important feature of the shop program that the material from the Junior High School program follows. The instructor should adapt this material in such a manner as to give increasing responsibility to the students in this matter. The success of the program observed may be measured in two ways:

1. The total absence throughout the school year of any accidents, or injuries.

2. The method whereby the students practise and appreciate the value of correct procedures and safe habits.

The shop must have an effective safety program. A major objective of our program is the development in each pupil of desirable attitudes and practices with respect to health and safety. The shop instructor has an exceptional opportunity to make a real contribution to the development of the student in this respect. The habits, attitudes and skills developed in the shop have implications in the home and the community.

The following are suggested features of a good shop safety program:

1. Frequent mention of health and accident hazards found in the community, home and school life of the pupil. Discussion should result in remedial action.

2. The use of safety films.

3. A stress on safe operation of tools and machines. This should be a development of reasoning as to cause and effect and not an enumeration of DON'TS. Checking and repetition of instruction is necessary to ensure that correct habits are formed from the beginning.

4. Attention to correct and approved personal habits, clothing and safety devices. The instructor sets a most effective example in this respect. A clean smock is part of the professional equipment.

5. Discussion of fire precautions and action to be taken in case of fire.

6. First-Aid equipment which is readily available. The instructor should be up-to-date as to First-Aid procedures.

7. Posters effectively displayed. Such posters are available from:

   (a) The Workman's Compensation Board, Provincial Government.
   (b) Education Department, Atlas Press Company, Kalamazoo, Michigan.
   (c) Stanley Tool Company.

   or they may be made by students in correlation with their art.

8. Use of safety slogans such as:

   (a) "Long Sleeves are Fine But Not At Shop Time".
   (b) "A Careful Man Is The Best Safety Device Known".

   These should be readily visible in the shop and mentioned periodically.

9. A student safety organization. Often this is the detailing of students to check for safety violations. The intention is always to develop a safety-conscious group of students.

10. A well organized shop with adequate working space about machines, non-slip mats at machines, floor lines, dynamic color painting of machines and equipment, etc.

NOTE: Accidents must be promptly reported to some senior school authority. If no other person is designated, this authority is the Principal.

SECTION D

DRAFTING FOR GENERAL MECHANICS 15, 16, 17.

It is recommended that from 10% to 20% of the course time be allotted to drafting. The drafting must be carefully integrated with the course outline.

Drafting equipment should be readily available. Some centres are fortunate in having the ideal arrangement of a separate room for drafting. All shops can arrange to have a small planning area in a clean well lighted area of the shop. This need be accommodation for as few as three or four students. The shop library should be located in this same area.

The suggested outline is composed of eleven sections. It is considered that these sections be used as follows:

First Year Course:	do sections 1 to 7 inclusive making application to shop work being done.
Second Year Course:	review sections 1 to 7 and cover two other sections making applications to shop work being done.
Third Year Course:	review sections done previously and complete other two sections. Apply to shop work.

<u>Specific Objectives</u>

1. To develop the ability to read and interpret plans and blueprints.

2. To develop the ability to make multiview drawings.

3. To develop basic drafting skills.

4. To develop the ability to readily apply drafting as an integral part of the shop situation.

Drafting Requirements

Section 1: Correct Use of Drafting Equipment:

Correct positioning and attachment of paper to the drafting board.
Use of equipment - drawing board, T-square, set squares, scales, instruments, etc.
Upper case Gothic vertical letters, figures, and fractions.
Conventional pencil lines and their contrast and representation.
Border lines and balancing of title block.
Able to read and understand scales.
Rules of dimensioning, extension lines, etc.

Section 2: Reading Working Drawing and Blueprints:

Practice in recognition of conventional lines, symbols, etc.

Section 3: Geometrical Construction:

Making use of problems likely to be found useful in the practical application of drafting fundamentals. (It is not necessary to do all in one year)

Bisect a straight line.
Bisect an angle.
Transfer an angle.
Draw a line parallel to a line and at a given distance.
Draw a line through a point parallel to a line.
To divide a straight line into any number of equal parts.
Divide a line into proportional parts.
Draw a line through a point perpendicular to a line.
Draw a triangle having given its three sides.
Draw a square inside and outside a circle.
Draw a regular pentagon.
Draw a regular octagon.
Draw any regular polygon upon a side.
Draw a hexagon within a circle.
Draw a circle through three given points.
Enlarge or reduce a simple drawing.

Section 4: Working Drawing - Orthographic Projection:

Fundamentals in orthographic projection.
Working on simple model such as prisms, irregular blocks, simple machine parts, wood joints, etc.
Scaling larger projects in orthographic.

Section 5: Isometric Drawing:

A pictorial method of representation by isometric drawing.
Fundamentals of isometric projection.
Free hand sketches in isometric.
Application of isometric to simple projects with instruments and to scale.

Section 6: Development of Simple Surfaces and Layouts:

Stretchouts of prisms, cylinders, pyramids, cones, etc.
Application to actual projects in the sheet metal field.
Layout of complete projects.

Section 7: Tracing and Blueprinting: (optional but strongly recommended)

Tracing, use of equipment and technique.
Pencil and ink.
Type of tracing material - paper, cloth and plastic.
Blueprinting and its procedure.

Section 8: Drawing of more complicated machine parts.
Sectional views - cutting plane, full, half, removed, revolved sections, etc.
Sectional lining and symbols of material for sectional lining.
Gears and cams.
Welding joints and their proper symbols.
Pipe fitting and valves and their proper convention symbols and designation of sizes.
Drawing of a pipe line, steam heating system or a pumping plant in symbols.

Section 9: Architectural Drawing:

Conventional symbols.
Views of girders, headers, stud walls, footing, joists, rafters, etc.
Simple plan of dog house, feeders, small garage, granary or shop, etc.
Sectional view of the above (c).

Section 10: Radio and Electrical Drawing:

Conventional electrical and radio symbols.
Simple diagrams of electrical circuits with symbols.
Being able to read circuit diagrams.
Working drawing of switches, generators, buzzers, motors, transformers, tubes, resistors, etc.
Simple working drawing of a radio.

Section 11: Automotive Drawing:

Sectional view of a car battery.
Working drawing of different electrical parts of an automobile, such as ignition coil, distributor, generator, etc.
Diagram of the electrical layout in the car.
Working drawing of carbureter, piston, fuel pump, oil circulation, clutch, gear ratio, etc.
Charts on engine tune-up, gas efficiency, braking, etc.

Reference Books

Abercrombie, T.R.: APPLIED ARCHITECTURAL DRAWING. Milwaukee. Bruce Publishing Company.

Berg: MECHANICAL DRAWING. Milwaukee. Bruce Publishing Company.

Diamond, Thomas: A PRIMER OF BLUEPRINT READING. Milwaukee. Bruce Publishing Company.

Fryklund and Kepler: GENERAL DRAFTING. Bloomington, Illinois. McKnight & McKnight Publishing Company.

Giesecke, Mitchel and Spencer: TECHNICAL DRAWING. New York. The Macmillan Publishing Company.

Johnson and Newkirk: MODERN DRAFTING. New York. The Macmillan Publishing Company.

Kepler, Frank Roy et al: AN ANALYSIS OF DRAFTING FOR TEACHERS. Boston. D.C. Heath and Company. 1948.

Jores, Mack M.: SHOPWORK ON THE FARM. McGraw Hill Publishing Company. 1955.

SECTION E

THE COURSE UNITS

WOODWORK:

Unit 1 Bench Woodwork (Emphasis - Hand Tools)
2 Furniture Construction (Emphasis - Power Tools)
3 Advanced Furniture Construction
4 Elementary Carpentry
5 Building Construction
6 Home Renovations and Improvements

METALWORK:

Unit 7 Sheet Metalwork
8 Forging
9 Welding
10 Machine Shop

ELECTRICITY:

Unit 11 Introduction to Code and House Wiring
12 Electric Appliances and Motors
13 Elementary Radio

AUTOMOTIVES:

Unit 14 Vehicle Maintenance
15 The Electrical System
16 Motor Repair
17 Motor Tune-Up

OTHERS:

Unit 18 Concrete and Plumbing
19 Farm Machine - Maintenance and Repair
20 Farm Power Units

See Section A, Page 11, for suggestions regarding organization of courses.

UNIT I: BENCH WOODWORK (EMPHASIS - HAND TOOLS)

8 to 10 weeks

Specific Objectives

1. To develop skill in the use of woodworking hand tools.
2. To develop skill in the maintenance of hand tools.
3. To develop a feeling of pride and satisfaction in the skillfull and proper use of well conditioned tools.
4. To introduce the methods of wood finishing.

STUDENT TO BE ABLE TO	STUDENT TO KNOW
1. Layout and make with hand tools at least the following joints: butt; dado (through and stopped); lap (end and half); mitre; mortise and tenon (blind, through and haunched); dowel; edge to edge. The preferred teaching procedure is to use the joint construction in fabrication of various projects.	Recognize and know the use of various wood joints. Understand the reasons and principles involved in making wood joints.
2. Correctly use the following hand tools:	
a. Measuring tools - ruler, tape, divider, framing square.	Maintenance, adjustment, use.
b. Guiding and testing tools - square, try square, bevel, level, plumb-bob, chalk line.	Maintenance, adjustment, use.

STUDENT TO BE ABLE TO (CONT'D)	STUDENT TO KNOW
c. Marking tools, scratch awl, compass, marking gauge, mortise gauge.	Maintenance, adjustment, use.
d. Tooth cutting tools - crosscut, rip, keyhole, back, coping saws, files.	Maintenance, use. Actual sharpening process for rip and crosscut.
e. Sharp edge cutting tools - wood chisel, star drill, rawl drill, cold chisel, hand axe, hatchet, drawknife.	Maintenance, use sharpening.
f. Smooth facing tools - fore plane, jack plane, smooth plane, hand scraper.	Maintenance, adjustment, use and sharpening.
g. Boring tools - auger bit, expansive bit, brace, hand drill, automatic drill.	Maintenance, adjustment, use and sharpening.
h. Fastening tools - hammer, screwdriver, nail set.	Maintenance, use and sharpening.
i. Holding tools - vise, bar clamp, "C" clamp, locally made devices.	Maintenance and use.
3. Correctly use:	
a. Glue	Glue - animal, casein, synthetic, consistency for use, rate of setting, strength, water resistance, manufacture, price, use.
b. Nails	Nails - common, finishing, names, lengths, how sold, uses.
c. Wood screws	Wood screws - round, flat, oval heads. Names, lengths, kind of metal, gauge number, number in packet, price, stock lengths, use.
d. Abrasives	Abrasives - sand papers - flint, garnet, aluminum oxide, grade, price, origin, production. Rottenstone, pumice, prices, how sold, use and abuse.

STUDENT TO BE ABLE TO (CONT'D)	STUDENT TO KNOW
4. Correctly use:	
a. Oil in finishing.	Raw linseed, boiled linseed, sealers. Colors, odors, drying qualities, prices and uses.
b. Varnish.	Color, odor, kinds, origin, drying qualities, uses.
c. Paint.	Enamels, etc. Origin, coloring, kinds, uses, prices.
5. Glaze a window, sash, etc.	Tools, preparation and putty. Value of priming coat.
6. To apply the common wood finishes and to properly maintain paint cans and brushes.	Purposes, components, etc. of finishing materials.
7. Recognize and select lumber. Prepare bill of material and plan of procedure. Calculate board measure and costs.	Properties of hardwood and softwoods. Defects of lumber. Lumbering in Canada. Carpentry as a trade - Alberta Apprenticeship and employment possibilities.

Projects and Activities

The following types of articles are suggested:

Step ladder, sawhorse, nail box, tool box, workbench, garden chair, cabinets, window screen, window sash, coffee tables, magazine racks, end tables, stools, etc.

Reference Books

Brown and Tustison: INSTRUCTIONAL UNITS IN HAND WOODWORK. Bruce Publishing Company.

Cramlet, Ron C.: WOODWORK VISUALIZED. Milwaukee. Bruce Publishing Company.

Douglass and Roberts: UNITS IN HAND WOODWORKING. McCormick - Mathers Publishing Company.

Jones, Mack M.: SHOPWORK ON THE FARM. McGraw Hill Publishing Company. 1955.

Reference Books (Cont'd)

Douglass and Roberts: PROJECTS IN WOODWORK. Wichita, Kansas. McCormick - Mathers Publishing Company.

Evans, Parks, Slatterie: HAND WOODWORKING. Toronto. Ryerson Press.

Gottshall: WOODWORK FOR THE BEGINNER. Bruce Publishing Company.

Griffith: ESSENTIALS OF WOODWORKING. Manual Arts Press.

Harmes: FURNITURE FOR THE AMATEUR CRAFTSMAN. Bruce Publishing Company.

Hjorth, Herman: PRINCIPLES OF WOODWORKING. Milwaukee. Bruce Publishing Company.

McGee and Brown: INSTRUCTIONAL UNITS IN WOOD FINISHING. Bruce Publishing Company.

Pattou: PRACTICAL FURNITURE FINISHING. Craftsmen Wood Service.

Queen's Printer: NATIVE TREES OF CANADA.

Shaver: FURNITURE BOYS LIKE TO BUILD. Bruce Publishing Company.

Shea and Wenger: WOODWORKING FOR EVERYBODY. International Textbook.

Siegele: CARPENTRY CRAFT PROBLEMS. Chicago. Drake and Company.

Wishart: WOODWORK PRACTICE AND THEORY. The Copp Clark Publishing Company.

Atlas Press Company, Kalamazoo, Michigan: (Canada - Price 65¢ each).

Book One, Volume One - 20 Practical Woodworking Plans for the Home Shop.
Book Two, Volume One - 18 Outdoor Equipment Woodworking Plans.
Book Three, Volume One - 16 Modern Furniture Woodworking Plans.
Book Four, Volume One - 20 Small Woodworking Project Plans.

Delta Publications:

Delta Power Tool Instruction: published four times a year, available free on request from Editor, Power Tool Instructor, 450B N. Lexington Avenue, Pittsburg 8, Pennsylvania. (Write on School Letterhead).

Reference Books (Cont'd)

Deltagram: published six times a year by subscription from Advertising Dept., Delta Power Tool Division, Rockwell Manufacturing Company, 400 N. Lexington Ave. Pittsburg 8, Penn.

Back copies of Deltagram in bound volumes:

No. 4580 - Volume 1: Deltagrams 1932 to 1936
4581 - Volume 2: Deltagrams 1936 to 1941
4582 - Volume 3: Deltagrams 1941 to 1946
4584 - Volume 4: Deltagrams 1946 to 1949
4590 - Complete set of 4 volumes.

Films:

1. Text Films - - McGraw Hill - Shop Work Series - Strip Films.
   (a) Care of Hand Tools.
   (b) Sharpening Hand Tools.
   (c) Auger bits and twist drills.
   (d) Sawing, planing and smoothing wood.

2. Teach-O-Filmstrips - Produced by Popular Science Publishing Company, and distributed by the Ryerson Press.
   (a) Safety. (b) Design. (c) Hardwood lumbering.
   (d) Hardwood Processing. (e) Finishing I.
   (f) Finishing II.

3. Stanley Film Strips - Stanley Tools, Education Department, New Britain, Conn. 9 Strip Films and Guide.

UNIT 2: FURNITURE CONSTRUCTION (EMPHASIS - POWER TOOLS)

8 to 10 weeks

Special Note:

Obviously only those power machines available in the shop will be used for detailed study and practice. However, this does not preclude the study of other machines and particularly commercial machines and equipment which may be done through the use of field trips, student reports, films and film strips.

To adequately handle this unit it is recommended that the following power equipment be available:

circular saw, jointer, woodworking lathe, jig saw, band saw, drill press, tool grinder, portable tools - particularly belt sander, portable drill and portable electric saw.

Specific Objectives

1. To teach the student to appreciate the reasons for good safety practices and procedures.
2. To develop good safety habits and attitudes in working with power tools.
3. To develop a reasonable degree of skill and knowledge in the use of power tools available.
4. To develop an appreciation of the factors involved in the mass production in using power equipment.
5. To introduce, or continue the study of wood finishing processes.

STUDENT TO BE ABLE TO	STUDENT TO KNOW
1. Use the power machines mentioned in the note above correctly and in accordance with safe procedures. Set up and use the available accessories.	Proper maintenance, safe procedures Limitations and abilities of particular machines and their accessories.

STUDENT TO BE ABLE TO (CONT'D)	STUDENT TO KNOW
2. Recognize and select lumber. Prepare bill of material and plan of procedure. Calculate board measure and costs.	Properties, defects. Lumbering in Canada. Carpentry and cabinet making as a trade.

Projects and Activities

1. Group:

At least one project to be handled as a mass production article. This work should be planned and developed by the students themselves and should be of some article which has common appeal. It might be a saw horse, a small window sash, a picture frame, or a small item of furniture.

2. Individual:

Each student should have experience with both spindle and face plate turning. The obvious projects being lamps, bowls, candle sticks, table legs, and lazy susans.

Reference Books

Cramlet, Ron C.: WOODWORK VISUALIZED. Bruce Publishing Company.

Douglass and Roberts: UNITS IN HAND WOODWORKING. McCormick - Mathers Publishing Company.

Douglass and Roberts: PROJECTS IN WOODWORK. Eichita, Kansas. McCormick - Mathers Publishing Company.

Gottshall: WOODWORK FOR THE BEGINNER. Bruce Publishing Company.

Griffith: ESSENTIALS OF WOODWORK. Peoria, Ill. Manual Arts Press.

Groneman, Chris. H.: GENERAL WOODWORKING. McGraw - Hill Publishing Company. 1952.

Harmes: FURNITURE FOR THE AMATEUR CRAFTSMAN. Bruce Publishing Company.

Hjorth: MACHINE WOODWORKING. Milwaukee. Bruce Publishing Company.

Jones, Mack M.: SHOPWORK ON THE FARM. McGraw - Hill Publishing Company. 1955.

Reference Books (Cont'd)

PORTABLE WOODWORKING POWER TOOLS. Van Nostrand, 1954.

Haines, Ray E: THE WOODTURNING LATHE. Van Nostrand Company, 1952.
THE BAND SAW AND JIG SAW. Van Nostrand Company, 1953.
THE CIRCULAR SAW. Van Nostrand Company, 1952.

Johnson and Newkirk: GENERAL WOODWORKING. Macmillan Publishing Company.

Lukowitz: FIFTY POPULAR WOODWORKING PROJECTS. Bruce Publishing Company.

Lush: IT'S FUN TO BUILD MODERN FURNITURE. Bruce Publishing Company.

Shaver: FURNITURE BOYS LIKE TO BUILD. Bruce Publishing Company.

Wishart: WOODWORK PRACTICE AND THEORY. The Copp Clark Publishing Company.

Atlas Press Company, Kalamazoo, Michigan: (Canada - Price 65¢ each).

Book One, Volume One - 20 Practical Woodworking Plans for the Home Shop.
Book Two, Volume One - 18 Outdoor Equipment Woodworking Plans.
Book Three, Volume One - 16 Modern Furniture Woodworking Plans.
Book Four, Volume One - 20 Small Woodworking Project Plans.

Delta Publications:

Delta Power Tool Instruction: published four times a year, available free on request from Editor, Power Tool Instructor, 450B N. Lexington Avenue, Pittsburg 8, Pennsylvania. (Write on School Letterhead).

Deltagram: published six times a year by subscription from Advertising Dept., Delta Power Tool Division, Rockwell Manufacturing Company, 400 N. Lexington Ave. Pittsburg 8, Penn.

Back copies of Deltagram in bound volumes:

No. 4580 - Volume 1: Deltagrams 1932 to 1936
4581 - Volume 2: Deltagrams 1936 to 1941
4582 - Volume 3: Deltagrams 1941 to 1946
4584 - Volume 4: Deltagrams 1946 to 1949
4590 - Complete set of 4 volumes.

Delta also has excellent pamphlets "Getting the Most Out of your Jointer", etc. which are available in large department stores.

UNIT 3: ADVANCED FURNITURE CONSTRUCTION

8 to 10 weeks

Special Note: Units I and 2 are prerequisite.

Specific Objectives

1. To develop more advanced knowledge and skill with the use of hand and power tools.

2. To make creditable articles of furniture in which the student may justifiably enjoy the craftsman's pride and joy of creation.

3. To develop good techniques of finishing and to finish articles properly. (If spray equipment is available it should be studied in this unit).

STUDENT TO BE ABLE TO	STUDENT TO KNOW
1. Use and condition hand tools and power tools available in a competent and safety-conscious manner.	Maintenance, adjustment, use.
2. Join and construct furniture using wood joints, glue, nails, screws and cleats.	Kinds, uses.
3. Apply principles of good design.	Features of good design.
4. Proceed with project work in a competent and efficient manner.	

Projects and Activities

Turned projects and furniture items made from hardwood.

References

See those for Units I and 2.

UNIT 4: ELEMENTARY CARPENTRY

8 to 10 weeks

Note: Unit 4 combines effectively with Unit 5.

Specific Objectives

1. To develop knowledge and skills necessary to perform the basic operations of carpentry.

2. To develop knowledge and skills necessary to maintain tools and equipment.

3. To apply mathematics and science in the field of carpentry.

STUDENT TO BE ABLE TO	STUDENT TO KNOW
1. Apply mathematics to carpentry.	How to calculate board measure. The elementary properties of the rectangle, and the triangle. How to convert decimals to fractions, and vice versa.
2. Use different types of saws.	Types of handsaws. The use of each saw. The maintenance of the handsaws.
3. Fasten boards by nailing.	Types and sizes of nails available. Requirements in building. Most effective nailing procedures. How to maintain a hammer.
4. Measure.	Types of rules available. Divisions on a rule. Methods of checking measurements.
5. Plumb, level and straighten.	Purpose. How to use the level, plumb bob, straight edge and chalk line.
6. Recognize terms of carpentry.	The basic terms - dictionary of carpentry.

STUDENT TO BE ABLE TO (CONT'D)	STUDENT TO KNOW
7. Use squaring methods.	How to use different types of squares. How to apply a square to a board. How to apply squaring methods to footings.
8. Understand the mathematical principles involved and use the rafter framing square.	Types of roofs. The fundamental measuring points. How to apply the tables found on the square: 1. To measure and cut common rafters. 2. To use the brace table. 3. To use the board measure table.
9. Use standard methods of carpentry.	Bracing for forms, wall sections and roofs. How to figure for openings. How to make corner posts and headers. How to apply backing on ceilings and walls. How to cut and install bridging. How to shingle.
10. Miscellaneous.	Maintenance and use of tools not covered above.

Contents of the Basic Tool Kit

1. Claw hammer
2. Hatchet
3. Crosscut Saw 8 point
4. Rip saw
5. Panel saw
6. Keyhole saw
7. Coping saw
8. Hacksaw
9. Smooth Plane
10. Jack Plane
11. Jointer Plane
12. Rabbet Plane
13. Spokeshave
14. Mill & Slim taper files
15. Auger Bit file
16. Cabinet scraper
17. Framing square
18. Combination square
19. Sliding T Bevel Gauge
20. Butt Gauge
21. 3' boxwood rule
22. Measuring Tape
23. Chalkline and Chalk
24. Ratchet brace and bits
25. Yankee Drill
26. Yankee Screwdriver
27. Set of Chisels
28. Carborundum
29. Spirit Level
30. Nail Sets
31. Claw bar
32. Nail puller

Projects and Activities

1. Group:

(a) Make a simple form section.
(b) Make a simple wall section.
(c) Make a simple gable roof with eave and trim.

Note: Minimalic technique may be useful in some situations.

2. Individual:

(a) Saw horse.
(b) Stake out for footings.
(c) Tool chest for tool kit.
(d) Such full size projects as feeders, wagon boxes, etc.

Reference Books

Brown and Tustison: INDUSTRIAL UNITS IN HAND WOODWORK. Bruce Publishing Company.

Jones, Mack M.: SHOPWORK ON THE FARM. McGraw Hill Publishing Company. 1955.

Roehl, Louis M.: FARMERS' SHOP BOOK. Toronto. Ryerson Press.

Thurmond, M.F.: SHOP WORK FOR FARM BOYS. Danville, Illinois. Interstate Printing Company.

Wilson and Werner: SIMPLIFIED ROOF FRAMING. McGraw - Hill Publishing Company.

Wishart: WOODWORK PRACTICE AND THEORY. Copp Clark Publishing Company.

See also references for Unit 5.

UNIT 5: FRAME CONSTRUCTION

8 to 10 weeks

Note: Unit 5 combines effectively with Unit 4.

Specific Objectives

1. To inform the student of accepted methods of house construction.
2. To impart knowledge necessary to construct a simple frame building.
3. To stress the need for proper methods in house construction.
4. To familiarize the student with the common terms of house construction.

STUDENT TO BE ABLE TO	STUDENT TO KNOW
1. Lay out footings and locate piers from a plan.	Blueprint reading as necessary. Size requirements of footings and piers. Method of construction of forms for footings and piers.
2. Set foundation forms.	Bracing requirements. Methods: 1. making form sections 2. making corner ties 3. making and fitting basement sash frames.
3. Lay out floor and ceiling joists and lay subfloor.	Proper spacing and layout. How to figure for chimney and stair openings. Requirements for beams.
4. Lay out plates of exterior walls and inside partitions from plan.	How to mark for studdings. How to mark for door and window openings. How to calculate the length of studdings. How to apply sheathing.

STUDENT TO BE ABLE TO (CONT'D)	STUDENT TO KNOW
5. Figure a gable roof with a given pitch, span and overhang.	Rafter framing principles. Eave and cornice construction. How to sheath and shingle the roof. Methods of bracing.
6. Interior wall finish.	Use of plasterboard. Use of composition board. Use of plaster and lath board.
7. Make and set a door and window frame.	Principles of door and window frame construction. Methods of setting door and window frames.
8. Apply casing to door and window frames.	Types of casing. Methods of mitring. Method of nailing. Method of fitting window sill.
9. Apply exterior finish.	Types of exterior finish. Methods of applying. 1. Cedar siding. 2. Asphalt Shakes Methods of figuring siding.
10. Simple stair construction.	Construction principles and design. Method of laying out.
11. Hang and lock a door.	How to place butts and locks. How to fit door and measure for the butts.
12. Fit a window or a sash.	How to measure and fit sash. How to fit windows.
13. Scaffold construction.	Safety features.

Projects and Activities

1. Group:

Every effort must be made to make this part of the course as practical as possible. Much will depend upon the local situation. The following approaches are recommended:

1. Group: (Cont'd)

(a) Actual full size buildings, garage, granary, workshop, summer kitchen, tool shed, garden house, dog house, smoke house, hog house, brooder house or poultry house as a group project. If the accommodation is limited this work will need to be done outside of the shop in the fall and spring. Another approach is to have groups of students (not more than 3 or 4) work on a small portion of a building. A platform about 6 x 6 is made in such a manner as to represent headers, joists, diagonal flooring, and on these platforms, plates, studs, etc., are erected. These can be stored in one pile until bracing is required so that a minimum of storage space is necessary. The variety of building experiences and procedures which can be developed by this approach becomes readily apparent. This is the invaluable experience of working with full size materials.

(b) Minimalic construction - models of bungalows, garages, granaries, etc., either as an individual project or by pairs of students. The scale should not be less than $1\frac{1}{2}'' = 1'0''$. This approach should be used where the accommodation absolutely precludes the possibility of full scale projects.

2. Individual:

(a) Make a door or window frame.
(b) Hang a door or fit a window.

<u>Reference Books</u>

Burbank, Nelson L.: HOUSE CONSTRUCTION DETAILS. New York. Simons - Boardman Publishing Company.

Cramlet, Ron C.: WOODWORK VISUALIZED. Milwaukee. Bruce Publishing Company.

Fryklund and Seebrest: MATERIALS OF CONSTRUCTION. Bruce Publishing Company.

Kenny and McGrail: ARCHITECTURAL DRAWING FOR THE BUILDING TRADES. McGraw Hill Publishing Company.

Lair: CARPENTRY FOR THE BUILDING TRADES. New York. McGraw Hill Publishing Company.

Wishart: WOODWORK PRACTICE AND THEORY. Copp Clark Publishing Company.

UNIT 6: HOME RENOVATIONS AND IMPROVEMENTS

8 to 10 weeks

Special Note: This unit requires discretion and good judgement. Much material can be handled in theory only. The importance of having competent tradesmen do renovations must be stressed.

Specific Objectives

1. To develop an appreciation of what minor alterations can do for an old house to make for more comfortable living.

2. To impart knowledge of basic methods of cabinet construction.

STUDENT TO BE ABLE TO	STUDENT TO KNOW
1. Appraise building in a general manner and appreciate factors concerned.	Determining age and construction features. Assessing methods and costs of improvement.
2. Remodel rooms.	How to remove and install partitions. How to waterproof and use furring strips. How to apply plaster board and decorative wallboard. How to apply window and door casing and base. Bracing and laying floors. Floor re-finishing. Decoration tips for: 1. Bedroom 2. Living room 3. Kitchen 4. Bathroom 5. Rumpus room

STUDENT TO BE ABLE TO (CONT'D)	STUDENT TO KNOW
3. Install Built-ins.	Kitchen Cabinet Construction: 1. Design principles and dimensions. 2. Framing principles. 3. Facing and shelving principles. 4. Top construction. 5. Drawer construction. 6. Availability of Hardware. 7. How to apply a suitable finish. Clothes Closets: 1. Design principles. 2. Framing principles. 3. Facing principles. 4. How to fit swinging and sliding doors. 5. Availability of hardware. 6. How to apply a suitable finish. Ironing Boards: 1. Design principles. 2. Types of hardware. 3. How to apply a suitable finish. Fire Place: 1. Design principles. 2. Framing. 3. Types of finishes - stone, brick, plaster. 4. Fire proofing. 5. Tiling. Valance Boxes: 1. Patterns. 2. Construction methods. 3. How to apply a suitable finish. Shelves: 1. Design principles for particular uses. 2. Methods of construction. 3. Materials. 4. How to apply a suitable finish.

STUDENT TO BE ABLE TO (CONT'D)	STUDENT TO KNOW
4. Make outside improvements.	Stoops: 1. Construction Details. 2. Materials. 3. Finishes. Patios: 1. Construction details. 2. Concrete work. 3. Brick or imitation stone work. Sidewalks: 1. Method of layout. 2. Materials. 3. Type of finish required. Exterior Painting: 1. Selection of colors. 2. Mixing paints. 3. Application of paint.

Projects and Activities

1. Group:

   (a) Build a cabinet for the school.
   (b) Install shelves in shop room.

2. Individual:

   (a) Build a fire place for student's home.
   (b) Build valance boxes for drapes for student's home.
   (c) Build an ironing board for student's home.
   (d) Etc.

Reference Books

Burbank, Nelson L.: PRACTICAL JOB POINTERS. New York. Simons-Boardman Publishing Company.

Burbank, Nelson L.: HOUSE CONSTRUCTION DETAILS. New York. Simons-Boardman Publishing Company.

Fryklund and Sechrest: MATERIALS OF CONSTRUCTION. Bruce Publishing Company.

Kenny and McGrail: ARCHITECTURAL DRAWING FOR THE BUILDING TRADES. McGraw Hill Publishing Company.

Reference Books (Cont'd)

Lair: CARPENTRY FOR THE BUILDING TRADES. New York. McGraw Hill Publishing Company.

Thurmond, M.F.: SHOP WORK FOR FARM BOYS. Danville, Illinois. Interstate Printing Company.

UNIT 7: SHEET METALWORK

8 to 10 weeks

Specific Objectives

1. To impart a reasonable knowledge of metallurgy and the part played by metals in our civilization.
2. To develop the ability to handle metals and an appreciation of the skills necessary in this medium.
3. To give experience in the soldering of the various types of sheet metal and the use of the various fluxes.

STUDENT TO BE ABLE TO

1. Use square, scriber, scratch gauge, wire and sheet metal gauges.
2. Use snips in cutting and notching, cutting circles and curves.
3. Folding and setting a hem by hand and by machine.
4. Allow for, and turn a wired edge by hand and by machine.

STUDENT TO KNOW

The Iron and Steel Industry:

1. The location and importance of the main bodies of ore.
   The five types of ore and their yield and quality of iron produced.
   Treatment from ore to finished product.
   The blast furnace, Open Hearth, Bessemer Converter, Cupula and Puddling, Electric.

STUDENT TO BE ABLE TO (CONT'D)

5. Make a grooved seam.

6. Turn an edge for the bottom of a cylinder.

7. Make and set a lock seam.

8. Use stakes in bending and forming, construct homemade stakes.

9. Use a chisel to cut sheet metal using a cold chisel and a vice, and hardwood block or lead block.

10. Use squaring shear, if available.

11. Use tinner's rivets, rivet set, self-tapping screws.

12. Make a piano-type hinge, if needed.

13. Make an improvised clamp from sheet metal.

14. Drill holes in sheet metal, special precautions needed.

15. Re-condition tools as required.

16. To fill, light and maintain a blow torch, or use a gas stove.

17. Tin a soldering copper and care for it.

18. Use solder efficiently. Acid core, bar and rosin core.

19. Use proper flux.

STUDENT TO KNOW

Economies practiced by the industry.
Heat treatment of steel.
Rolling mills and ingot treatment.
Alloys and their effects.
Economic connection between the standard of living and the production of steel.

2. Aluminum, Copper, Lead and Zinc, could be treated as above.

3. How to read and make blueprints or drawings involving sheet metal layouts for rectangular objects, cylindrical objects, conical and irregular surfaces.

4. Develop an auxiliary view as necessary in stretchouts for patterns.

5. Identify: Tin plate, black iron, galvanized iron, copper brass, mild steel, high carbon steel, high speed steel, carboloy.

6. Prepare surfaces for soldering.

7. Use fluxes for various metals.

8. Composition and melting points of hard and soft solder.

(1 and 2 inclusive should also appear in Unit 10 - if Unit 7 is not covered in the same year).

ools

Rules, scribers, compasses, hammers (ball pein, setting, etc.) snips, Rivet sets, punches, pliers, groovers, stakes, shears, angle iron for stakes and bench edge, soldering equipment. Also desirable: combination turning, burring, wiring machine; slip rolls; bar folder; shears.

Suggested Projects

Drill sharpening gauge, soldering paste box, tin cup, scoop, match box, tool tray, watering trough for chickens, feed buckets from gallon or five gallon buckets, tractor funnels, tool box, tackle box, transition piece for pipe, machinery repairs, roof jacks, planters, etc.

Reference Books

Ashcroft and Easton: GENERAL SHOP WORK. Toronto. The Macmillan Publishing Company.

Dragoo and Dragoo: GENERAL SHOP METALWORK. Metallurgy, bench metal, art metal, ornamental and sheet metal with projects on each. Good elementary books.

Feirer, John L.: GENERAL METALS. Toronto. McGraw Hill Publishing Company. 1952.

Johnson and Newkirk: METAL CRAFT. Toronto. The Macmillan Publishing Company.

Tustison and Kranzusch: METALWORK ESSENTIALS. This is a fairly complete elementary coverage of general metals, practices, and tools. It is well illustrated, readable as a student text, and includes questions.

Roehl, Louis, M.: FARMERS' SHOP BOOK. Toronto. Ryerson Press.

Jones, Mack M.: SHOPWORK ON THE FARM. McGraw - Hill Publishing Company. 1955.

UNIT 8: FORGING

8 to 10 weeks

Specific Objectives

1. To appreciate the possibilities and limitations of a forge in shaping, cutting and welding metal.
2. To perform basic metal-shaping operations.
3. To be able to build and maintain a fire in the forge.
4. To know the use of the tools connected with forge work.
5. To gain a further knowledge of metallurgy.

STUDENT TO BE ABLE TO	STUDENT TO KNOW
1. Clean the forge, build a fire and maintain it.	How to make allowances for bending.
2. Cut metal with hot hardies.	How to perform the operations listed.
3. Bend, draw, upset as required in projects.	Appreciate the metallurgy necessary to understand the heat treatment of steel.
4. Make a sample weld.	
5. Anneal, case harden and temper a piece of steel.	

Tools

Forge, anvil, hammers, tongs, etc.

Suggested Projects

Clevis, eyebolts, iron work for stock rack, or farm trailer, tongs, cold chisels, lathe chisels, knives, chain links, hook and eye, hay hook, golf caddy cart, wrought iron projects.

Reference Books

Dragoo and Dragoo: GENERAL SHOP METALWORK.
Metallurgy, bench metal, art metal, ornamental and sheet metal with projects on each. Good elementary books.

Feirer, John L: GENERAL METALS. Toronto. McGraw Hill Publishing Company. 1952.

Harcourt: ELEMENTARY FORGE PRACTICE.
Very good. 38 projects with procedure steps. Metallurgy and heat treating well covered.

Roehl, Louis, M: FARMERS' SHOP BOOK. Toronto. Ryerson Press.

Jones, Mack M.: SHOPWORK ON THE FARM. McGraw Hill Publishing Company. 1955.

UNIT 9: WELDING

8 to 10 weeks

Specific Objectives

1. To introduce the student to welding.

2. To develop an appreciation of the usefulness and importance of welding in modern industry including agriculture.

3. To give the student an opportunity to handle and use welding equipment.

4. To stress safe practices in the operation of welding equipment.

5. To enable the student to join parts of projects by welding or brazing.

STUDENT TO BE ABLE TO	STUDENT TO KNOW
ELECTRIC WELDING:	
1. Ready equipment for arc welding (set the machine).	Types of machines, A.C. and D.C. and their comparisons.
2. Strike an arc and hold it.	Care and operation.
3. Run continuous straight beads.	Safety precautions.
4. Weld butt joints, lap and tee joints, corner welds.	How to identify the popular metals and select the proper rod.
5. Cut metal with the arc.	How to prepare work for welding.
6. Drill holes with the arc. (If time permits, instructor can demonstrate heating, pre-heating and brazing with the carbon arc torch).	Polarity and arc blow.
OXYACETYLENE WELDING:	
1. Set up welding equipment.	Brief history of oxyacetylene equipment.
2. Adjust the regulators.	Care and operation of equipment.
3. Light torch and adjust the flame.	Dangers involved and safety precautions.
	Select tips and welding rods, fluxes.
4. Extinguish the flame.	How to light the torch and adjust the flame.
5. Run beads.	
6. Make lap and butt welds.	Uses of acetylene welding.
7. Brazing.	

Tools and Equipment

For rural centers, the A.C. welder 180 - 200 amps. output is recommended since they are in more common use on the farms than any other machine.

If possible both arc and acetylene welding outfits should be secured.

Tools and Equipment (Cont'd)

A small corner of the shop with a portable fireproof screen is recommended. Concrete floor is preferred, but if the present floor is wood, it may be covered in that area with asbestos hardboard. A sturdy steel welding bench and machinist's vise for holding work is very necessary.

Notes

1. See section 42 of the Canadian Electrical Code regarding electric welders.

2. The Provincial Welding Examiner, Department of Trade and Industries, is available for advice and assistance.

Projects and Activities

1. Beads may be run on any small scrap pieces of steel.

2. Projects may include any repairs to tools, or machines, ash trays, foot scrapers, truck grill guard, fuel drum stand, house number sign, mail box post, welded candlestick holders, stool, welding bench, small hopper for grain loader, iron saw horse.

Reference Books

Air Reduction Company (Airco): OXYACETYLENE WELDING AND CUTTING INSTRUCTION COURSE LECTURES.

Forney Manufacturing Company. Fort Collins, Colorado. FORNEY ARC WELDING MANUAL.

Linde Air Products Company, Ltd.: THE OXYACETYLENE HANDBOOK.

The Jones F. Lincoln Arc Welding Foundation: WELDING HELPS FOR FARMERS.

The Lincoln Electric Company: NEW LESSONS IN ARC WELDING.

Shop Plans are also available from the Forney Manufacturing Company as well as large wall charts.

Jones, Mack M.: SHOPWORK ON THE FARM. McGraw - Hill Publishing Company. 1955.

UNIT 10: MACHINE SHOP

8 to 10 weeks

Note: This unit could well be slanted towards Farm Machinery Maintenance and Repair. As tools in this area will likely be limited to the drill press, grinder, and engine lathe, projects will have to be chosen with a view to equipment available.

Specific Objectives

1. To learn the use of and care for machine tools, hacksaws, files, drills, countersinks, calipers, micrometers, punches, chisels and rules.

2. To appreciate the work of the machinist and the workers in the metal trades.

3. To develop an appreciation of accurate measurements and tolerances.

4. To develop an ability to discriminate between inferior and satisfactory tools, machines and materials.

5. To develop safety practices in this field and a pride of workmanship.

STUDENT TO BE ABLE TO	STUDENT TO KNOW
1. Use marking ink and lay out work.	Cutting speed of hacksaw blades and number of teeth for the right job.
2. Use a hacksaw efficiently.	Types and kinds of files for the right job.
3. Use and sharpen drill, centre punches and chisels.	Draw filing and its use in tool sharpening.
4. Drill Press. Use and care.	How to move a centre punch mark.
5. Use of bending jigs.	How to move a hole with a chisel.
6. Cut threads with taps and dies.	Calculate tap drill size without a table.
7. Use cutting oil.	Optional. The use of type MX carborundum wheel on a circular saw for cutting metal. Stress safe operation.
8. Finish and polish surfaces.	

STUDENT TO BE ABLE TO (CONT'D)	STUDENT TO KNOW
9. Use grinder to recognize various steels and alloys.	Appreciate the part this machine plays in industry.
10. Make sketches of castings, find serial and model numbers of parts of machines.	The mathematics used by the machinist.
11. Perform fundamental operations on an engine lathe. Oil lathe. Care of chucks. Centre drill work and set-up in various chucks. Grind cutter bits. Face, turn and finish. Cut a thread. Cut a taper. Use steady rest and follower rest. Use knurling tool and cut-off tool. Internal threading and boring.	The part played by precise measurements, how to use micrometers and calipers.

Suggested Projects

Footscrapers, C Clamps, wrought iron furniture, house number, lawn ornaments, golf caddy cart, trammel points, beam compass, plumb bob, square, lamps, wrench, calipers, centre punch, setting hammer, parallel jaw clamps, fly-tying vise, marking gauge, depth gauge, drill gauge, etc.

Reference Books

Ashcroft and Easton: GENERAL SHOP METALWORK.

Dragoo and Dragoo: GENERAL SHOP METALWORK.

Giachino and Feirer: BASIC BENCH-METAL PRACTICE.

Johnson and Newkirk: METAL CRAFTS. The Macmillan Publishing Company.

Jones, Mack M.: SHOPWORK ON THE FARM. McGraw - Hill Publishing Company. 1955.

Knight, Roy E. MACHINE SHOP PROJECTS.

Roehl, Louis M.: FARMERS' SHOP BOOK. Toronto. The Ryerson Press.

South Bend Lathe Company: HOW TO RUN A LATHE.

Thurmond: SHOP WORK FOR FARM BOYS. Interstate Printing Company.

UNIT II: INTRODUCTION TO CODE AND HOUSE WIRING

8 to 10 weeks

Special Note The local and provincial requirements with regard to wiring must be observed. It is recommended that only instructors experienced in this work offer this unit of instruction.

Specific Objectives

1. To interest the student in the application of electricity in the home and on the farm.

2. To familiarize the student with the Canadian Electrical Code, particularly those sections dealing with interior and farm wiring.

STUDENT TO BE ABLE TO

1. Make acceptable standard joints, taps, and splices.

2. Solder and tape the above.

3. Install boxes, switches, outlets and fixtures using rigid conduit, E.M.T., flexible conduit, and non-metallic sheathed cable.

4. Measure and select according to the tables, the proper wire and cable size according to gauge numbers.

5. Connect up three and four way switches.

6. Draw electrical wiring diagrams for small houses and farms.

7. Make repairs to wiring installations such as replacing switches, fuses, receptacles, drop cord, etc.

STUDENT TO KNOW

Federal, provincial and local legal wiring requirements with particular reference to the farm and home.

How to read a watt-hour meter.

Where the various joints and taps may be used.

The more common types of outlet boxes, connectors and proper methods of locating and fastening the boxes in place.

The wire tables.

The following sections of the Canadian Electrical Code, 1953, Sections - 0, 2, 4, 10, 12.

Tools, Equipment and Materials

In addition to the usual hand tools found in all shops three sizes of socket type screwdrivers, insulation stripper, electricians' pliers, B. & S. gauge, pipe reamers, pipe dies, bending hickeys for rigid conduit and E.M.T., rubber, plastic and friction tape, assortment of wire of various sizes used in house wiring, assortment of service switches, fuse panels, connectors, straps, rigid conduit and E.M.T., with fittings, and flexible conduit.

Projects and Activities

1. Stripping wire.

2. Making joints and taps, soldering and taping. Wire service, switches, simple lighting circuits using N.M.S.C., conduit (rigid, E.M.T. and flexible).

3. Read a Watt-hour meter and find cost of power used.

4. Panel job work.

Reference Books

Audel's NEW ELECTRIC LIBRARY VOL. VII. WIRING HOUSE, LIGHT AND POWER CIRCUITS.

CANADIAN ELECTRICAL CODE PART I (SIXTH EDITION). 1953.

Richter: WIRING SIMPLIFIED. Park Publishing Company. (Available through Eatons).

Schaenger: RURAL ELECTRIFICATION. Bruce Publishing Company.

Segal: ELECTRICAL CODE DIAGRAMS VOL. I. McGraw Hill Publishing Company.

Terrel, Craft: AMERICAN ELECTRICIANS' HANDBOOK. John Wiley and Sons, Ltd. 1953.

Pamphlet: REGULATIONS GOVERNING INTERIOR AND FARM WIRING. The Electrical Branch, Department of Industries and Labor.

Jones, Mack M.: SHOPWORK ON THE FARM. McGraw - Hill Publishing Company. 1955.

UNIT 12: ELECTRICAL APPLIANCES AND MOTORS

8 to 10 weeks

Specific Objectives

1. To familiarize the student with various electrical appliances and their operating principles, common faults and weaknesses.

2. To impart the necessary knowledge and skills in order that the student may make minor repairs to appliances and motors.

3. To study and understand the principles involved and applied in D.C. and A.C. motors.

STUDENT TO BE ABLE TO	STUDENT TO KNOW
1. Replace cords, plugs, attachment caps, heating elements, brushes, etc. in common household appliances.	Factors governing torque.
2. Install and adjust electric fence, electric water tank heaters.	Essential parts of the motors and their function.
3. Electric Motors: Lubricate motors, install pulleys and adjust belt tension.	Types of D.C. motors and selection of the type for service required. Speed control and regulation.
4. Replace starting switches.	Types of A.C. motors; split phase, shaded pole, capacitor start, repulsion start-induction run, universal and synchronous.
5. Replace bearings and turn down commutators.	How to reverse the direction of rotation of motors.
6. Rewind running and starting coils for single phase induction motors.	Purpose of overload protective devices and operation.
	Internal connections of each type of motor.
	The principles of operation of the various types of motors.

Tools, Equipment and Materials

Hand tools, metal lathe and drill press. Used electrical appliances for repairs or which may be dismantled for examination. Obtain as many small motors as possible, A.C. and D.C. which may be taken apart and assembled, repaired, etc. Other supplies should include a supply of wire for coil winding, armco and fish paper, tape and varnish.

Projects and Activities

1. Repair household appliances such as electric iron, toaster, mixers, vacuum cleaner, etc.

2. Trace out the circuit for electric fence and draw the circuit diagram. Set up the electric fence and put in operation.

3. Examine the construction of each type of small single phase motors and D.C. motors.

4. Clean motors, replace bearings, wicks, starting switches, etc.

5. Replace worn brushes, clean commutators, or turn them down on lathe if available.

6. Rewind field coils.

Reference Books

Braymer: ARMATURE WINDING AND MOTOR REPAIR. McGraw - Hill Publishing Company.

Braymer: REWINDING SMALL MOTORS. McGraw - Hill Publishing Company, 1949.

Dudley: A.C. MOTOR WINDING. McGraw - Hill Publishing Company.

Jones: FUNDAMENTALS OF APPLIED ELECTRICITY. Bruce Publishing Company.

Jones, Mack M.: SHOPWORK ON THE FARM. McGraw - Hill Publishing Company. 1955.

Stafford: TROUBLES OF ELECTRICAL EQUIPMENT. McGraw - Hill Publishing Company.

UNIT 13: ELEMENTARY RADIO

8 to 10 weeks

Specific Objectives

1. To develop an interest in and an appreciation of the field of electronics and radio.

STUDENT TO BE ABLE TO	STUDENT TO KNOW
1. Test tubes.	How sound travels.
2. Assemble radio parts on panels.	Radio waves; frequency.
3. Read elementary radio wiring diagrams.	Parts of a radio receiver and their function in the set.
	Triodes, grid action.
	A.B.C. supplies.
	Prong numbering.
	Transistors, tuning, ocillator, code ocillator, modulation: A.M. F.M., detection of A.M., heterodyne and I.F., signal tracing, color code and standard sizes.

Projects and Activities

1. Dismantle tubes, draw sections, learn the parts, pin layout, elements, etc.

2. Repair radios: - test tubes, signal tracing to locate defective stage, measuring voltages on tube in defective stage, visual check and ohmmeter tests.

3. Build amplifier or receiver (kits recommended).

Reference Books

Ghirardi, Alfred: RADIO PHYSICS COURSE. Radio Technical Publishing Company.

Hellman, Charles: ELEMENTS OF RADIO. D. Van Nostrand Publishing Company.

Marcus and Levy: ELEMENTS OF RADIO SERVICING. McGraw - Hill Publishing Company.

Watson, Welsh, and Eby: UNDERSTANDING RADIO. McGraw - Hill Publishing Company.

UNIT 14: VEHICLE MAINTENANCE

8 to 10 weeks

Specific Objectives

1. To familiarize the student with the names, locations, functions and characteristics of the automobile.

2. To teach the student the requirements, purpose and correct procedure of general operational servicing and car upkeep.

STUDENT TO BE ABLE TO	STUDENT TO KNOW
1. Recognize relationship of various units and parts.	Names of operational parts and their functions.
2. Observe operational sequence of starting, running and stopping the engine.	How to start, run and stop the engine.

STUDENT TO BE ABLE TO	STUDENT TO KNOW
3. Observe characteristics of running gear - wheel base, tread, turning radius, front wheel alignment.	Definitions, measurements and adjustments.
4. Wash and polish car, clean glass and upholstery.	How to wash, polish, clean glass and upholstery.
5. Lubricate.	Lubricate entire car chassis, springs, air cleaner, oil filter, water pump, etc.
6. Give general periodical service. Use jack safely, change tire correctly.	Grades and kinds of tires including tubeless; tire treads; correct tire inflation; tire rotation, repair flats (hot and cold patches). Battery service. Engine cleaning. Fan belt inspection, Fuel sediment bowl. Hose connections, etc.

Tools, Equipment and Materials

Floor jack, hand tools.

Projects and Activities

1. Activities to include jobs performed on car or units available in the shop.

2. Exercises in bench work should be included to develop skills in the use of hand tools.

3. Bench work in related metal projects - try squares, drill grinding gauges, dividers, riveted joints, etc.

Note: Related Drafting. Material taken from actual automotive parts, units and bench projects. Simple automobile parts which can be taken into the drafting room for the purpose of teaching fundamentals of orthographic, isometric and cabinet projection.

Reference Books

Crouse: AUTOMOTIVE MECHANICS. Toronto. McGraw - Hill Publishing Company.

Crouse: AUTOMOTIVE ELECTRICAL EQUIPMENT. Toronto. McGraw Hill Publishing Company.

Glenn: EXPLORING AUTOMOTIVES.

Heitner: AUTOMOTIVE MECHANICS. D. Van Nostrand Company.

Kuns: AUTOMOTIVE ESSENTIALS. Bruce Publishing Company.

General Motors Manuals: General Motors Products of Canada - Service Promotion Department, Oshawa, Ontario.

A.B.C. of Hand Tools
Power goes to work
We Drivers
Automotive Jobs in Your Town
How Your Car is Made
Transportation Progress
Diesel - The Modern Power
Metallurgy and Wheels
Research Looks to New Horizons
Precision - A Measure of Progress
Can I be an Engineer
The Challenge of Engineering's Second 100 years
When the Wheels Revolve
Electricity and Wheels
Optics and Wheels
Short Stories of Science and Invention
American Battle of Abundance
User's Guide
Chemistry and Wheels
Can I be a Craftsman

The following colored charts are available through General Motors Corporation:

Automobile Fuel System
Automobile Ignition System
Engine Types

UNIT 15: ELECTRICAL SYSTEM

8 to 10 weeks

Specific Objectives

1. To familiarize the student with the fundamentals of electricity, symbols used, electrical circuits, magnetism and those characteristics which will enable the student to apply these principles in automobile circuits.

2. To understand the function, construction and operation of: the ignition system, the starting motor, the generator, the lighting system, the automobile type storage battery.

STUDENT TO BE ABLE TO	STUDENT TO KNOW
1. Recognize characteristics of electricity, flow, force, conductors, insulators.	Theories, laws, applications, etc. related.
2. Make an electric magnet; test polarity of generators and motor fields.	
3. Compute the resistance and wattage in a circuit.	
4. Make an air coil, check its strength and inserting a soft metal core, again checking it for pull.	
5. Test and service switch, ignition coil distributor, condenser, breaker points and spark plugs. Overhaul a complete distributor.	
6. Perform rough timing.	
7. Use timing light.	
8. Service and check spark advance mechanism.	
9. Trace electrical circuit throughout the starting motor.	

STUDENT TO BE ABLE TO (CONT'D)

STUDENT TO KNOW

10. Test motor for speed and torque.

11. Check voltage in the starter motor circuit.

12. Dismantle and assemble generator.

13. Check and service all mechanical parts: bearings, brushes, springs.

14. Test running of generator, plotting of charging amperage and voltage on a graph.

15. Trace electrical circuits of an automobile.

16. Replace blown fuses and tracing of cause.

17. Remove, clean and replace battery cables.

18. Understand the construction and operation of the storage battery.

19. Detect causes of battery failure, and do battery testing.

20. Correctly remove and install a battery.

Tools, Equipment and Materials

0-15 voltmeter
0-50 Ammeter
bar magnet
glass
iron filings
6 volt dry cell
various sizes of wire
terminal assortment
6 volt bulbs
small compass
resistance wire
soldering equipment
demonstration boards
used distributors
coils, condensers and ignition units
coil tester
condenser tester
voltmeter
hand tools
battery
battery charger
test clamp
battery cables
starting motors

Projects and Activities

Activities to follow in line with what students should know and be able to do. For example - check timing
trace electrical circuit
overhaul generator, etc.
bench work - make simple electric circuits; electro-magnets, small motors, batteries (if equipment available).

Reference Books

Auto-Lite: ELECTRICAL EQUIPMENT MAINTENANCE AND OPERATION MANUAL. Available from any United Motor Service center.

Crouse: AUTOMOTIVE ELECTRICAL EQUIPMENT. Toronto. McGraw - Hill Publishing Company.

Delco-Remy: ELECTRICAL EQUIPMENT OPERATION AND MAINTENANCE HANDBOOK. Available from any United Motor Service center.

Elfrint, H.: THE AUTO OWNER'S HANDBOOK. Floyed Chyma Publisher. Los Angeles, California.

Glenn: EXPLORING AUTOMOTIVES.

Heitner: AUTOMOTIVE MECHANICS. D. Van Nostrand Publishing Company.

Kuns, Ray F.: AUTOMOTIVE ESSENTIALS. Bruce Publishing Company.

Kuns, Ray F.: AUTOMOTIVE SERVICE, VOLUMES I AND 2. Bruce Publishing Company.

UNIT 16: MOTOR REPAIR

8 to 10 weeks

Specific Objectives

1. To be able to perform motor repair jobs (as equipment permits).

2. To understand more clearly the various construction features and functions of the parts of an automobile engine.

STUDENT TO BE ABLE TO	STUDENT TO KNOW
1. Install new piston rings.	Principles and theory concerned.
2. Fit new piston pins.	
3. Grinding valves and seats, adjust valve clearance.	
4. Clean carbon.	
5. Install new gaskets.	
6. Adjust main and rod bearings.	
7. Do clutch refacing and adjustment.	
8. Engine oil - checking, changing and flushing.	
9. Removal and replacement of parts and units associated with many jobs such as: cylinder heads, manifolds oil pans, springs, etc.	

Tools, Equipment and Materials

Two or more motor units for students to work on. A check usually indicates a wealth of local resource material of this nature.

Set of hand mechanics' tools including - socket wrenches, pliers, box wrenches, screw drivers, tension wrench, etc.

Ring compressor, valve spring tool, valve grinding equipment, shim stock, micrometer caliper, etc.

Projects and Activities

1. Disassembly and assembly of motor units available and as considered advisable.

2. Students should be given certain bench projects to develop good working habits and skills in the use of tools. Bench projects suggested: C clamp, tap and drill gauge, drill grinding gauge, setting hammer, threading bolts, N.C. and N.F., etc.

3. Students should be encouraged to perform jobs on other than shop motor units, as time and shop facilities permit, e.g. lubrication jobs, installing rings, grinding valves, setting valve clearance, etc.

Reference Books

Ashcroft and Easton: GENERAL SHOP WORK. Toronto. The Macmillan Publishing Company.

Crouse: AUTOMOTIVE MECHANICS. Toronto. McGraw Hill Publishing Company.

Glenn: EXPLORING AUTOMOTIVES.

Heitner: AUTOMOTIVE MECHANICS. D. Van Nostrand Company.

Kuns: AUTOMOTIVE ESSENTIALS. Bruce Publishing Company.

Motor's: AUTOMOBILE REPAIR MANUAL. R.W. Bruce. Midland, Ontario.

This publication can be procured only from the Canadian representatives for "Motor" - R.W. Edwards, Midland, Ontario.

Crouse Workbook Series: New York. McGraw - Hill Publishing Company.

Automotive Tools
Automotive Chassis
Automotive Engines
Automotive Electricity
Automotive Service and Trouble-Shooting

General Motors Manuals: General Motors Products of Canada - Service Promotion Dept., Oshawa, Ontario.

A.B.C. of Hand Tools
Power goes to work
We drivers
The Challenge of Engineering's Second 100 years
When the Wheels Revolve

Reference Books (Cont'd)

General Motors Manuals:

Automotive Jobs in Your Town
How Your Car is Made
Transportation Progress
Diesel - The Modern Power
Metallurgy and Wheels
Research Looks to New Horizons
Precision - A Measure of Progress
Can I be an Engineer
Electricity and Wheels
Optics and Wheels
Short Stories of Science and Invention
American Battle of Abundance
User's Guide
Chemistry and Wheels
Can I be a Craftsman

UNIT 17: MOTOR TUNE-UP

8 to 10 weeks

Specific Objectives

1. To be able to make minor repair jobs.
2. Locate faulty running mechanisms and remedy the same.
3. Appreciate the fact that small ailments when checked, or adjustments made, lead to smoother more economical performance of the entire unit.

STUDENT TO BE ABLE TO	STUDENT TO KNOW
1. Overhaul water pump.	Principles and procedures involved.
2. Check cooling system (change thermostat). Install proper thermostat for winter and summer driving.	
3. Overhaul fuel pump.	
4. Clean and check carburetor.	

STUDENT TO BE ABLE TO	STUDENT TO KNOW
5. Adjust fan belt.	
6. Adjust brakes (bleeding).	
7. Adjust timing.	
8. Check spark plugs, breaker points, distributor, advance or retard spark.	
9. Check compression ratio.	
10. Fuel pump pressure.	
11. Change light bulbs.	
12. Operation of horn, tail lights, wind-shield wiper.	
13. Service battery.	

Tools, Equipment and Materials

Three or four used: carburetors, fuel pumps, starting motors, generators, distributors, etc.

Set of hand tools (mechanics) testing instruments, e.g. pressure gauge, volt meter, ammeter, spark plug gap gauge, feeler gauge, timing light, etc.

Projects and Activities

Shop work on motors as available.

Reference Books

See references for Unit 16.

UNIT 18: CONCRETE AND PLUMBING

8 to 10 weeks

Special Note: The concrete section of this unit can very well be integrated with other units - such as Building Construction.

Specific Objectives

1. To develop in the student a knowledge of simple concrete work and plumbing.
2. To develop confidence and ability in the student to carry out such work.
3. To familiarize the student with the proper use and care of tools in such work.
4. To develop habits of purposeful work planning.

CONCRETE

STUDENT TO BE ABLE TO	STUDENT TO KNOW
1. Mix concrete: Selection of material for mixing, use clean water, proportions of materials and tests. Curing of concrete and cold weather concrete. Mixing by hand and by machine. Ready mix concrete.	Kinds, and sizes of gravel. Reasons for having clean water. Factors that determine strength. Precautions or requirements that should be taken.
2. Forms: Laying out a footing, sidewalks, gate posts; building of forms, bracing of forms, use of ties in foundation forms. Use of steel for reinforced concrete and technique of reinforcing.	
3. Pouring: Technique of pouring and tamping, working and troweling the surface, grating for walks and landings. Working in color. Waterproofing.	

STUDENT TO BE ABLE TO (CONT'D)	STUDENT TO KNOW
4. Plastering: Proportional mixing of scratch coat, brown coat, and finish coat.	Basic chemistry involved.
5. Stucco: Mixing of scratch and finish coat. Coloring with mortar stains or cement stucco rendering.	

Tools, Equipment and Materials

Hand woodworking tools, trowel, plumb line, mixing box, hoe. Sand, gravel, cement, lumber, quicklime, hydrated lime, calcined gypsum.

Projects and Activities

Building of concrete steps and landing, sidewalks, footing, foundation walls, post footing, flagstone for walks, boat anchor blocks, gate posts, tiles, etc. Some of the larger projects could be built to scale.

PLUMBING

STUDENT TO BE ABLE TO	STUDENT TO KNOW
1. Use: oakum, lead, white lead, cutting oil. Proper use of pipe wrenches, thread cutting tools and any other tools involved in pipe layouts.	Uses, techniques, safety, etc.
2. Recognize and manipulate pipe: aluminum, asbestos, brass, cement, clay, concrete, copper, glass, iron lead, steel, plastics, rubber, wood. Pipe available in different weights, standard, double strong, double extra strong. Sizes range commonly from 1/8" to 12".	What some of the common pipes are used for and the reason for their use.

STUDENT TO BE ABLE TO (CONT'D)	STUDENT TO KNOW
3. Recognize and use fittings. Various types of joints, 90° elbow, 45° elbow, tee, cross, 45° Y-bend, return bend, reducer, coupling, cap, bushing, plug, and nipple. Various forms of valves, gate, globe, check, angle, needle pressure, reducing, safety.	The reasons for using each type of joint or where a joint of a type would be used. Function of valves.
4. Join pipe: soldered, leaded, flanged, welded, screwed. Measure pipe and cut thread. Coupling of pipe.	
5. Make septic tank layout and field tile layout.	Some of the important regulations and code concerned with plumbing layouts.

Tools, Equipment and Materials

Plumbing tools such as pipe wrenches, pipe cutters, etc.

Materials: lead, oakum, white lead, odd length of pipes and joints, valve.

Projects and Activities

Setting up a sink trap, taking apart a valve and seeing how it functions, cutting threads and assembling some pipe, studying material necessary for a farm sewage system.

Reference Books

Canada Cement Company, Ltd.: PAMPHLETS ON CONCRETE WORK. Montreal, Quebec.

Canada Cement Company, Ltd.: CONCRETE IMPROVEMENT AROUND THE HOME.

Jones, Mack M.: SHOPWORK ON THE FARM. McGraw - Hill Publishing Company, 1955.

Portland Cement Company: A PRACTICAL COURSE IN CONCRETE.

UNIT 19: FARM MACHINERY MAINTENANCE AND REPAIR

8 to 10 weeks

Special Note: It is apparent that this unit can very well be integrated with other units - particularly those in the metal area. Such a procedure is strongly recommended.

If Agriculture is also offered in the school concerned a close liaison with the agriculture instructor will be profitable, and must be considered essential.

Equipment is of paramount importance for this phase and all possibilities must be investigated. The obvious sources are implement dealers and local farmers.

Field trips to farms and implement shops should be a feature of this unit.

For all machines the initial discussions and demonstrations will lead to an understanding of just what each machine is designed to do and how it does it. The machines selected must be decided locally, but the following are suggested as suitable:

Tiller combine
Seed drill
Cultivator
Rod and cable weeders
Blades (Noble)
Feed grinders
Food Choppers

Harrows (spike and spring tooth)
Packers
Discs
Binders and swathers
Combines and threshers
Mowers and rakes
Hay balers

Specific Objectives

1. To convince students of the necessity for regular maintenance and repair of farm machinery.

2. To impart the knowledge and skill necessary to maintain and repair farm machinery.

3. To develop ability to make freehand drawings of broken castings.

4. To develop a confidence, ability and pride in using and maintaining tools.

STUDENT TO BE ABLE TO	STUDENT TO KNOW
1. Lubrication: Select and lubricate. Replace fittings. Replace filters. Exercise safety practices.	Purpose of lubrication. Types of oils and greases. Fittings. Purpose and design of oil filters. Reasons for safety procedures.
2. Prepare equipment for storage. Prepare equipment for overnight protection (motors, radiators, drapers, or canvases on binders and combines).	
Prepare equipment for between season storage. If stored in open, select a spot of high ground away from any buildings, remove and clean such equipment as cushions, canvases, and belts and store in a dry shed away from chickens, mice and direct sunlight. Remove all dirt and chaff which would otherwise catch and hold moisture causing parts to rust. Lubricate thoroughly to prevent dust getting into the bearings. Block the machine up to take the weight off the tires. Coat all bright parts with sticky grease. Make a list of needed parts and order right away.	Reasons, materials and procedures.
Perform pre-season check. Make sure all new parts ordered have been properly installed. Check the spark plugs, magnetos, cooling systems on motors. Check all moving parts for ease of operation.	
Repaint equipment. The proper time to paint is just prior to storage. It assures a good cleaning job on the machine and a good chance to check the machine more closely before storage and assures maximum protection during storage. Old brooms; putty knives and wire brushes are best for cleaning and use a good grade of machinery paint to finish.	
3. Repairing: Shop skills and knowledge applied to the practical situation. The time spent on this section will depend on amount of machinery available for repairing and the size and equipment of the shop.	Reasons, materials and procedures.

STUDENT TO BE ABLE TO (CONT'D) | STUDENT TO KNOW

Repairing farm machinery during the season that the machine should be running can be very costly. A thorough check-up of the machine prior to storage in the fall is the best insurance against this. Many farmers follow the practice of listing needed repairs and adjustments in a little notebook kept in the tool box of the machine to assist in conditioning the machine when more time is available. Constant vigilance during lubrication will often prevent any major breakdowns.

A proper machine shed with a good floor will assist greatly in overhauling machinery. If the building is heated it will make it possible to do more of this work during bad weather and the off season months.

The ability to identify needed parts and part numbers is of prime importance in repairing and overhauling machinery, and will often save extra trips to town. Sketching practice is of value.

The safety precautions should also be stressed here in the repair and overhaul of machinery with regard to the proper use of hoists, jacks and blocking.

Tools, Equipment and Materials

Hand tools, etc.

Projects and Activities

As required by equipment available. Good set of notes including sketches and diagrams.

Reference Books

Bedel and Gardner: HOUSEHOLD MECHANICS. Scranton, Penn. International Textbook Company.

Cornetet: METHODS OF MEASUREMENT. Bloomington, Illinois. McKnight and McKnight Publishing Company.

Dickinson, Sherman: JOB OPERATIONS IN FARM MECHANICS. Danville, Illinois. Interstate Printing Company.

Elliott, L.N.: FARM AND HOME MECHANICS, A GUIDE TO THE PROGRAM.

Jones, Mack M.: SHOPWORK ON THE FARM. McGraw - Hill Publishing Company. 1955.

Roehl, Louis, M.: FARMERS' SHOP BOOK. Toronto. The Ryerson Press.

Thurmond: SHOP WORK FOR FARM BOYS. Danville, Illinois. Interstate Printing Company.

UNIT 20: FARM POWER UNITS

8 to 10 weeks

Special Note: This unit can very well be integrated with the automotive units. If equipment is available the time allotment could in this way be profitably increased.

Specific Objectives

1. To convince students of the necessity for regular maintenance of power equipment.

2. To impart knowledge and skills necessary to do regular maintenance.

3. To impart knowledge and skills necessary to effect minor adjustments and repairs.

STUDENT TO BE ABLE TO

1. Start and run engine (car or smaller engine).
2. Service car or tractor - check oil, battery, refuel.
3. Check spark plugs, distributor, points, etc.
4. Clean spark plugs.
5. Disassemble and assemble engine.
6. Adjust fan belt; oil pressure; clutch plate and pedal, brakes, steering gear.
7. Make a study of the internal combustion engine.

STUDENT TO KNOW

Sources of farm power.

Stationary and mobile power plants.

Conversion of automobile engines into stationary or mobile plants; their use as drivers for pumps, generators, blowers, etc.

Types of fuel: octane rating, gasoline for high compression tractor and stationary engines, need for high octane gasoline in high compression engines, kerosene for low compression engines, diesel fuel for diesel tractors, caterpillars and stationary engines.

Maintenance: routine care of the engine, the car, the truck and tractor; proper lubrication, winter precautions.

Carburetion (elementary principles).

Ignition, function, units.

Electrical systems.

Care and servicing of units in cooling, fuel, ignition systems.

Safe driving.

Tools, Equipment and Materials

Running motors
Hand tools
Jacks, Hoists
Demonstration equipment (carburetors, electrical equipment, etc.)
The benefit of having tractors available is apparent.

Projects and Activities

1. Disassemble, assemble and adjust gasoline motor. It is recommended that not more than two boys work on a motor if possible.
2. Practise starting, adjusting and maintaining motors.

Projects and Activities (Cont'd)

3. Keep a good set of notes with diagrams and sketches.

Reference Books

Elliott, L.N.: FARM AND HOME MECAHNICS, A GUIDE TO THE PROGRAM.

Cook, Scranton and McColly: FARM MECHANICS, TEXTBOOK AND HANDBOOK. Interstate Press.

General Motors Corporation: WHAT MAKES IT TICK. Oshawa, Ontario.

General Motors Corporation: A POWER PRIMER. Detroit, Michigan.
POWER GOES TO WORK
WHEN THE WHEELS REVOLVE

See references listed in Automotive Units 14, 15, 16, and 17.

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